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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/608,855	06/27/2003	Francesco Ciovacco	2110-47-3	8247

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EXAMINER

NADAV, ORI

ART UNIT PAPER NUMBER

2811

DATE MAILED: 01/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/608,855	Applicant(s) CIOVACCO ET AL	
	Examiner ori nadav	Art Unit 2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 November 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-53 is/are pending in the application.
- 4a) Of the above claim(s) 7,12,13,16-18,23,34-40 and 50-53 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6,8-11,14,15,19-22,24-33 and 41-49 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>6/27/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

The examiner confirms that claims 16-18 and 50-43 are grouped together.

Applicant's election with traverse of species 1 (claims 1-6, 8-11, 14-15, 19-22, 24-33, 36-38 and 41-49) in the reply filed on 11/12/2004 is acknowledged. The traversal is on the ground(s) that if an independent claim reads on species 1, then the examiner should search and examine the independent claim and all claims that depend from the independent claim. This is not found persuasive because if an independent claim reads on species 1, it does not mean that the dependent claims also read on species 1. The dependent claims can read on patentably distinct species, and thus should not be examined with species 1.

Claims 36-38 are further withdrawn from consideration as being dependent from and thus directed to a patentably distinct species (species 3).

The requirement is still deemed proper and is therefore made FINAL.

Claim Objections

Claim 11 is objected to because of the following informalities: The phrase "chosen in the group" should read "chosen from the group". Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 2-6, 8, 15, 20-22, 24-31, 41-44 and 46 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claimed limitations of varying an etching voltage between said plasma and said wafer, as recited in claims 2, 24 and 46, are unclear as to how an etching voltage can vary between a condition (plasma) and a physical location (wafer).

The claimed limitation of "it comprises the step", as recited in claim 15, is unclear as to which element is "it".

The claimed limitation of "30 s", as recited in claim 6, is unclear as to which element is "s".

The claimed limitation of "the plasma", as recited in dependent claim 24, is unclear as to which plasma applicant refers, since both claims 24 and 20 recite a plasma.

The claimed limitations of removing portions of the substrate by parts in series, and depositing a second polymeric film on the walls by pads in series, as recited in claim 24, are unclear as to what is meant by "removing/depositing...parts in series".

The claimed limitation of a second polymeric film, as recited in claim 24, is unclear as to the structural relationship between the second polymeric film and the device, since a first polymeric film is not recited in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 9, 14-15, 19-21 and 45-47, insofar as in compliance with 35 U.S.C. 112, are rejected under 35 U.S.C. 102(b) as being anticipated by Chen et al. (5,807,789).

Chen et al. teach in figures 4-6 and related text a process for forming trenches with an oblique profile and rounded top corners, comprising the steps of:

through a first polymerizing etch, forming in a semiconductor wafer depressions delimited by rounded top corners (column 2, line 55); and

through a second polymerizing etch, opening trenches at said depressions;

characterized in that said second polymerizing etch is performed in variable plasma conditions (column 2, line 60 to column 4, line 18),

wherein said step of forming said second polymerizing etch comprises varying an etching voltage between said plasma and said wafer,

wherein said step of varying comprises increasing said etching voltage,

wherein said second polymerizing etch is an HBr- and O₂-based etch,

wherein said step of forming a first polymerizing etch and said step of forming a second polymerizing etch are performed using a masking structure,

wherein it comprises the step of filling said trench with a dielectric material.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4-6, 8, 10-11, 19-22, 24-33, 41-44 and 48-49, insofar as in compliance with 35 U.S.C. 112, are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al.

Chen et al. teach substantially the entire claimed structure, as applied to claim 1 above, except an etching voltage being a discrete-ramp voltage of steps of constant duration of 30 s. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use an etching voltage being a discrete-ramp voltage of steps of constant duration of 30 s in Chen et al.'s device in order to obtain the best device characteristics, based on routine experimentation and optimization.

Regarding claims 8 and 24, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to place Chen et al.'s wafer in an etching chamber and to supply a constant chamber voltage thereto, in order to form the device in a known processing location (an etching chamber).

Regarding claims 10-11, 22 and 26, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use Cl₂ and N₂ and a substance

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chosen in the group comprising CHF_3 , CH_2F_2 in the polymerizing etch in Chen et al.'s device, in order to improve the etching steps of making the device.

Regarding claims 10-11, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to fill Chen et al.'s trench with a dielectric material in order to form the device as taught by Chen et al.

Regarding claims 32-33, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to fill Chen et al.'s trench with a silicon oxide by CVD, in order to simplify the processing steps of making the device by depositing a known dielectric material in a conventional deposition method.

Regarding claims 24-25, 27-31 and 44, Chen et al. teach filling the chamber with a plasma mixture of gases; setting the temperature, pressure and gas flow; setting a chamber voltage; setting a series wafer voltages; creating a series of etching voltages between the substrate and the plasma; removing portions of the substrate by parts in series; and depositing a second polymeric film on the walls by pads in series, wherein the plasma mixture of gases comprises mixing hydrogen bromide and oxygen, wherein a rate of depositing the second polymeric film increases as the absolute value of the etching voltages increase, wherein depositing the second polymeric film further comprises controlling the growth of the walls of the trench by the series of etching voltages, wherein creating a series of wafer voltages further comprises setting the wafer

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voltage to 10 volts for a first thirty seconds, setting the wafer voltage to 20 volts for a second subsequent thirty seconds, and setting the wafer voltage to 30 volts for a third subsequent thirty seconds, exposing decreasing portions of the wafer; and keeping a slope of the walls of the trench substantially constant, wherein the slope the walls is at an angle between sixty-five and eighty-five degrees to a vertical, wherein the steps have different durations.

Regarding claims 41-43, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a non-uniform voltage step function being a discrete parabolic voltage function and a continuous parabolic voltage function in Chen et al.'s device in order to improve the device characteristics by using routine experimentation and optimization.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Reference A is cited as being related to the formation of STI.

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Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 and 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

Any inquiry concerning this communication or any earlier communication from the Examiner should be directed to *Examiner Nadav* whose telephone number is **(571) 272-1660**. The Examiner is in the Office generally between the hours of 7 AM to 4 PM (Eastern Standard Time) Monday through Friday.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is **308-0956**



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PRIMARY EXAMINER
TECHNOLOGY CENTER 2800

O.N.
1/24/05